

rance have too generally caused them to be lost sight of. S.

CISTERNS, LEAD PIPES, AND WATER SUPPLY.

We return to the appendices to the "Report on the Supply of Water to the Metropolis," issued by the General Board of Health, chiefly to make some extracts from the evidence concerning cisterns and lead pipes. Dr. Arthur Hassall being asked,—

"Have you made any examinations of cistern water?" says,—"I have, many. A cistern is a small reservoir, and has all the faults of reservoirs: the water contained in it is generally exposed to light, air, and the sun, and the dead and living organic matter, as in the case of the reservoirs, too often goes on accumulating from day to day, the former seriously contaminating, by decomposition, the purity of its water: the living organic productions present in the water of cisterns resemble those of the water of the company by which it is supplied: certain forms, however, become developed in the water of cisterns with great rapidity, as the *entomostraca*, especially *Cyclops quadrangulus*, *Lynceus longirostris*, *Daphnia quadrangula*, *Infusoria*, *Confervee*, and *Diatomee*: the *entomostraca*, and some of the *Infusoria*, swim freely about in the water, while the *Confervee* and *Diatomee* either adhere to the sides or else fall to the bottom of the cistern, together with the grit and dead organic matter, forming an ever-increasing mass, which is stirred up on each renewal of the water only to enside in still greater quantity, until after the lapse of weeks, months, or even years, some fortunate accident, or frequently the offensive and putrid state of the water causes the cistern to be cleaned, and a removal of the putrescent and noxious matter. On making inquiries as to the frequency with which cisterns are cleaned, I was astonished to find how generally they are neglected; a neglect which is to be explained partly by ignorance of the necessity which exists for repeated and careful cleansing, and partly by the inconvenient and absurd position in which cisterns are very generally placed, mounted high up, frequently just over the privy or closet, and often requiring ladders to reach them; but the evils of cisterns are not merely aggravated by neglect and bad management, there are faults of construction connected with them: thus the bottom is usually level, and the tap inserted about two inches above this level, leaving a space for the continued accumulation of grit and dead and living organic matter: this evil might be obviated by having the cistern of a rounded form at the bottom, the discharge pipe issuing from the centre. Lastly, the material of cisterns is bad: they should be made of glass, earthenware, or marble."

He was questioned as to the actual effect of sewer-water:—

"Have you any evidence to show that sewer-water does contain sulphuretted hydrogen in such large quantity as to be prejudicial and even fatal to animal life?—With a view of determining this question, I made the following experiments:—1st experiment. A given quantity of Thames water, known to contain living infusoria, was added to an equal quantity of sewer water: examined a few minutes afterwards, the animalculæ were found to be either dead, or deprived of locomotive power and in a dying state. 2nd experiment. A small fish placed in a wine glass of sewer water, immediately gave signs of distress, and after struggling violently, floated on its side, and would have perished in a few seconds, had it not been removed, and placed in fresh water. 3rd experiment. A bird placed in a glass bell-jar, into which the gas evolved by the sewer-water was allowed to pass, after struggling a good deal, and showing other symptoms of

arrangements of this kind, and more desirous of something in some slight degree to their sewage condenser. Now, we find, hold them, that in ancient times churches were built in a round form, and not long, like ours, and that the place for the steeple was always in the middle," assertions for which even Mr. Elliott will not stand him! He argues from this, that "our division of the churches from the churches was another article of treason against God!" In the face of this, our reformers ordered that "the churches should remain as they have done in times past."

the action of the gas, suddenly fell on its side, and, although immediately removed into fresh air, was found to be dead. These experiments were made, in the first instance, with the sewer-water of the Friar-street sewer: they were afterwards repeated with the water of six other sewers on the Middlesex side of the river, and with the same result, as respects the animalculæ and fish, but not the bird: this, although evidently much affected by the noxious emanations of the sewer-water, yet survived the experiment.

Would you infer from these experiments that sewer-water, as contained in the Thames near to London, is prejudicial to health?—I would most decidedly; and regard the Thames, in the neighbourhood of the metropolis, as nothing less than diluted sewer-water."

As to the use of lead pipes and cisterns, Dr. R. Angus Smith says:—

"The use of lead pipes is common enough; and although the danger from lead has often been pointed out, there is no diminution in the amount used. It is acknowledged that with soft water, lead is very dangerous; but I am disposed to think that it is dangerous even with hard, except when a crust forms upon it. When a lead pump is used, no matter how hard the water is, there is still lead to be found in it. In one case I found lead where there were 62 grains of lime salt in a gallon: the family filtered the water, but that did not quite remove it, although it was much improved. This shows the lead to have been in complete solution, although the water was hard. The pump was made of lead, so that there was a constant friction preserving the surface clean and assisting comminution.

In another case, where there was a lead pump and well, the water also coming from a badly-drained and putrid underground, the water was acid, and an acid salt of lead was found in the water, strong enough to have a distinct taste of lead, and otherwise nauseous from the other salts, such as nitrates and chlorides. A few bubbles of sulphuretted hydrogen made the whole of a deep brown instantly, and it was lamentable to find that the persons who used it did not suspect any evil from this source.

The use of zinc in lead pipes has been proposed as a remedy, but it is not desirable to drink even zinc. There is a lead pipe made in Manchester covered with tin: a very thin film of it protects it considerably from the action of water acidulated with acetic acid. Probably for water-pipes it may be very useful. It is time that some change should be made in the small water-pipes now made of lead, and that the use of lead pumps and cisterns should be done away with, unless they can be protected."

Up to this time it has been broadly stated that soft pure water acts more powerfully on lead than hard water. Evidence is given to show that one is not more injurious than the other.

Mr. Spencer (of Liverpool) says:—"Those who have observed the destructive effects of hard water on cisterns, especially in Liverpool, where the water is pre-eminently hard, but who have not studied the matter chemically, have been at a loss to account for some of the scientific opinions so much at variance with their daily observation. In a word, the closet-experimenter has usually come to the conclusion, that soft water only acts upon lead, while the practical observer finds that cisterns are more rapidly corroded by hard water: hence has arisen so much conflicting opinion. A little reflection, however, will render it obvious that the effects of practice can scarcely be observed by the mere immersion of slabs of brightened lead into glass vessels containing either hard or soft water, and there suffering them to remain for a few weeks, perhaps only so far covered as to prevent evaporation or the accession of dust.

It must be recollected also that, as cisterns are constructed, lead is not the only metal which has to be dealt with; there being the solder which is used for the joints. Now this substance, which is an admixture of lead and tin, will, when immersed in water along with lead, act as a distinct metal, and give rise to a

voltaic action between the lead, the solder, and the water. This will cause a rapid corrosion at the joints, but it will be more or less active in proportion to the hardness or chemical impurity of the water."

A working plumber, William Millard, gives the following evidence:—

"What is your observation of the difference of action of hard and soft water on leaden cisterns?—The hard water eats the cistern away; the soft water, that is rain-water, does not sensibly touch it at all. The hard water of Highgate will, in a few years, eat the bottom of a leaden cistern entirely away, so that it will be useless.

In how many years?—In about three or four years.

Does not a leaden cistern usually last longer than that in Highgate?—No; it eats holes in the bottom, particularly at the places where there is solder, giving it a honeycombed appearance. This is so much the case, that it is a common custom here for the people to have their cisterns painted.

Is that a protection?—Yes, if the paint be allowed time to get thoroughly dry before the water is let into the cistern, the water does not set upon dry lead, and the cistern will then last for years."

DOING THINGS BY HALVES AT ST. PAUL'S.

The proposal which originally appeared in THE BUILDING of throwing open to the street the entire western front of St. Paul's, has been compromised by the dean and chapter, by allowing the gates of the enclosure to stand open for the general promenade of the public. The object originally contemplated was to give greater effect to the building itself as seen from the street, while at the same time the entire thoroughfare would be greatly improved. The project was set aside by the authorities chiefly upon the ground that the space in question would be merely made the resort of the idle and the mischievous. The result, however, of the present arrangement is, that all the nuisance and inconvenience apprehended in the first instance is actually provided for by affording a large recessed playground for every little idle urchin, and ragamuffin in the neighbourhood, while neither the public at large, nor the immediate inhabitants of the vicinity derive any adequate advantage from the change. The only proper way to make the improvement complete, is to adopt the basis of Mr. Barber's plan: that is,—throw open the roadway to Queen Anne's statue, run a light iron hurdle or fence along the bottom of the steps to prevent the intrusion of children or improper persons, and set back the present iron railings on each side as far as the north and south doors, close to or within a few feet of the church.

The effect of the whole would be a clear and unobstructed view of the great western front as seen from the street, with an ordinary thoroughfare between the statue and the steps: while on the northern side the omnibus stand which now encumbers the roadway would be put farther back, leaving standing-room as well as space for carriages to draw up to the surrounding shops; and on the south side the main road would be reached by the coach stand.

Where so great a public advantage is to be obtained at so trifling an expense, surely it is unwise of the parties concerned to oppose any longer the alteration. WATKINSON.

BRITISH ARCHÆOLOGICAL ASSOCIATION. —After a general meeting on Wednesday, the 12th inst., the council and some of the members dined together at the Freemasons' Tavern, under the genial presidency of Mr. James Heywood, M.P. Sir George Strickland, Bart., Mr. Wilson, M.P. (Clitheroe), Mr. Heyworth, M.P. (Derby), Mr. Pettigrew, Dr. Lee, Mr. Planche, Mr. Baily, Mr. White, Mr. Halliwell, and others spoke, and a very pleasant evening was spent. Sir Oswald Mosely has been elected President for the present year, and the congress will be held at Derby.